

Crosswalk between the *Inventory U.S. Greenhouse Gas Emissions and Sinks by U.S. State: 1990-2020* and the State Inventory Tool (SIT) (January 2022 edition)

The EPA recognizes that a number of states rely on the State Inventory Tool (SIT) to prepare their state GHG inventory Estimates. The SIT includes default activity data and estimates that states can use as a starting point for compiling a state-level GHG inventory. The default data included in SIT is based on EPA's *newly disaggregated Inventory of U.S. Greenhouse Gas Emission and Sinks by State: 1990-2020* (hereafter *GHG Inventory by U.S. State*). However, some differences exist between default data in SIT and the annual *GHG Inventory by U.S. State* estimates due to differences in methods, data and level of completeness. For example, for industrial processes and product use (IPPU) sector, SIT has limited state-specific default data and instead encourages users to enter data/estimates including from EPA's GHGRP. In some cases, in SIT, state-level data has been unavailable (e.g., because it is confidential business data, or the use of national level modeling that currently does not provide state-level outputs) or lags in state data compared to availability of national level data. Therefore, the default approaches in SIT may not fully reflect the latest updates for some categories (e.g., use of GHGRP data) and may not reflect all industrial categories reflected in the national *Inventory* for which methods are provided in the 2006 IPCC Guidelines and its refinements/supplements. In addition, the SIT provides two alternate approaches to estimating emissions (calculating CO₂ from transportation based on vehicle miles traveled (VMT) and calculating emissions from electricity consumption), which are not based on national *Inventory* methods. Table 1 below provides a detailed crosswalk and summary of key differences where methods/data, and or completeness differ by IPCC sector/category.

The version of SIT published in March 2022 (January 2022 edition), implemented several updates that brought it in closer alignment with the first version of the *GHG Inventory by U.S. State* data, including updating default activity data and emissions factors across all sectors, and moving to regional apportionment of ODS substitutes. EPA is currently evaluating how to use the additional state level data and/or methodological approaches available through the national *Inventory* disaggregation to supplement or improve the embedded calculations and defaults in SIT. SIT users will retain the ability to customize the tool with their own data in lieu of using defaults. EPA will continue to coordinate with states agencies and organizations currently using SIT on how to prioritize and implement updates to SIT. The SIT is released annually with updates, and release of an update aligning the tool's default information with the 2nd publication of state-by-state GHG data is planned for December 2022/January 2023.

Table 1. Crosswalk Between the GHG Inventory by State and State Inventory Tool Methods and Data by IPCC Sector/Category

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/ method (Y/N)	Key Differences	Plans to align SIT with <i>GHG Inventory by U.S. State</i> data
Energy					
Fossil Fuel Combustion <i>Transportation</i> <i>Electric Power</i> <i>Industrial</i> <i>Residential</i> <i>Commercial</i> U.S. Territories	CO ₂	Y	Mostly Y with some differences in adjustments	<p>The main differences between the SIT and <i>GHG Inventory by U.S. State</i> totals are:</p> <p>SIT does not currently subtract energy used in IPPU from the Energy results.</p> <p>SIT includes non-energy uses of fossil fuels with fossil fuel combustion.</p> <p>SIT includes an optional module to estimate emissions associated with electricity consumption</p> <p>SIT provides an alternate approach to estimating CO₂ emissions from transportation based on vehicle miles traveled (VMT).</p>	* (Exploring ways to include industrial sector energy adjustments in SIT)
Non-Energy Use of Fossil Fuels	CO ₂	Y	Y	Included with Fossil Fuel Consumption in SIT.	NA
Stationary Combustion (excluding CO ₂)	CH ₄ , N ₂ O	Y	Y	SIT uses IPCC default emission factors for electric power sector and <i>GHG Inventory by U.S. State</i> uses factors by fuel and combustion type.	*(SIT will switch to emissions factors by fuel and combustion type.)
Mobile Combustion (excluding CO ₂)	CH ₄ , N ₂ O	Y	Y	SIT activity data includes jet fuel bunkers	*(EPA will update bunker fuel data to match the Fossil Fuel Combustion CO ₂ module.)
Coal Mining	CH ₄ , CO ₂	P	Y	<p>SIT uses an apportionment approach for underground mine methane emissions for 1991 and 1992 as data were previously unavailable.</p> <p>Default data is not available in SIT for fugitive CO₂ emissions from coal mining.</p>	*, Δ

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with <i>GHG Inventory by U.S. State</i> data
Abandoned Underground Coal Mines	CH ₄	Y	Y	SIT uses the same general method as the <i>GHG Inventory by U.S. State</i> but calculates emissions on an individual mine-by-mine basis. The AMM model used for the national Inventory and the <i>GHG Inventory by U.S. State</i> uses @Risk Monte Carlo simulation software and estimates emissions by basin, state (for reporting years 2020 and onward), and abandoned mine status type, resulting in slightly different estimates.	NA
Petroleum Systems	CO ₂ , CH ₄ , N ₂ O	P	N	Default data is not available in SIT for all states for all sources. Different approach for vented and flared gas. Different years of data.	*
Natural Gas Systems	CO ₂ , CH ₄ , N ₂ O	P	N	Not all <i>GHG Inventory by U.S. State</i> sources included in SIT (e.g., meters in distribution segment). SIT includes gathering and gas processing under transmission. In <i>GHG Inventory by U.S. State</i> they are included under production and processing. Different approach for vented and flared gas. Different years of data.	*, Δ
Abandoned Oil and Gas Wells	CO ₂ , CH ₄	N	N	This source category is not included in SIT.	Δ
Incineration of Waste	CO ₂ , CH ₄ , N ₂ O	Y	Y	Included in SIT Waste module.	NA
Wood Biomass and Biofuels Consumption (memo item)		N	N	NA	NA
International Bunker Fuels (memo item)		P	Y	SIT bunker fuel calculations are completed in the FFCO ₂ module.	NA
Industrial Processes and Product Use					
Cement Production	CO ₂	Y	Y for 1990-2009 N for 2010-2019	<i>GHG Inventory by U.S. State</i> uses GHGRP emissions data adjusted for CEMS for 2010-2020.	*
Lime Production	CO ₂	P	N	Default data is not available in SIT for all states for all years <i>GHG Inventory by U.S. State</i> uses facility count to disaggregate emissions for 1990-2009 and GHGRP emissions adjusted for CEMS for 2010-2020.	*
Glass Production	CO ₂	N	N	This source category is not included in SIT. Some emissions could be partially reflected in SIT in estimating emissions for soda ash consumption.	Δ

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with <i>GHG Inventory by U.S. State</i> data
Other Process Uses of Carbonates	CO ₂	P	N	SIT includes under Limestone and Dolomite Use. SIT includes soda ash consumption emissions with production, instead of in Other Process Uses of Carbonates which <i>GHG Inventory by U.S. State</i> does.	*(EPA is evaluating moving and/or relabeling these categories within SIT to be consistent with the GHG Inventory by State.)
Ammonia Production	CO ₂	Y	Y, similar for 1990-2009 N, differ for 2010-2019	For 1990-2009, <i>GHG Inventory by U.S. State</i> and SIT use the same USGS capacity data. SIT allocates state production by multiplying state % by national production and assumes all feedstock is natural gas, whereas the <i>GHG Inventory by U.S. State</i> multiplies state % by the national GHGI emissions, which accounts for differences in emissions from production using natural gas and petroleum coke. <i>GHG Inventory by U.S. State</i> doesn't account for pet coke more granularly yet (1 facility in KS). The <i>GHG Inventory by U.S. State</i> uses GHGRP emissions data for 2010-2020.	*
Urea Consumption for Non-Agricultural Purposes	CO ₂	Y	N	The <i>GHG Inventory by U.S. State</i> allocates emissions based on populations data and SIT assumes the same percentage as agricultural urea use.	*
Nitric Acid Production	N ₂ O	P	N	Default data is not available in SIT for relevant states for all years	*
Adipic Acid Production	N ₂ O	P	N	Default data is not available in SIT for relevant states for all years	*
Caprolactam, Glyoxal, and Glyoxylic Production	N ₂ O	N	N	This source category is not included in SIT. Note, <i>GHG Inventory by U.S. State</i> only includes emissions from caprolactam. When glyoxal and glyoxylic acid are included in the national <i>Inventory</i> , they will be added also to the <i>GHG Inventory by U.S. State</i> .	Δ
Carbide Production and Consumption	CO ₂ , CH ₄	N	N	This source category is not included in SIT.	Δ
Titanium Dioxide Production	CO ₂	N	N	This source category is not included in SIT.	Δ
Soda Ash Production	CO ₂	Y	Y except for emissions from soda ash consumption	Emissions from production are calculated using the same data and method. SIT includes soda ash consumption emissions with production, instead of in Other Process Uses of Carbonates as allocated in the <i>GHG Inventory by U.S. State</i> .	*
Petrochemical Production	CO ₂ , CH ₄	N	N	This source category is not included in SIT.	Δ
HCFC-22 Production	HFC-23	P		Default production data is not available in SIT.	*

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with <i>GHG Inventory by U.S. State</i> data
Carbon Dioxide Consumption	CO ₂	N	N	This source category is not included in SIT.	Δ
Phosphoric Acid Production	CO ₂	N	N	This source category is not included in SIT.	Δ
Iron and Steel Production & Metallurgical Coke Production	CO ₂ , CH ₄	P	N	SIT includes data on total steel production from AISI for 1997-2010 (and proxies 2010 data through current year). Data is available for some states directly and some as groups of states. SIT averages production by type and across groups of states evenly. <i>GHG Inventory by U.S. State</i> uses similar AISI data for 1990-2010 but allocates across groups of states based on Census data. For 2010-2020, <i>GHG Inventory by U.S. State</i> uses GHGRP data to allocate including more detail on process types e.g., BOF/EAF split.	*
Ferroalloy Production	CO ₂ , CH ₄	N	N	This source category is not included in SIT.	Δ
Aluminum Production	CO ₂ , CF ₄ , C ₂ F ₆	P	N	Default data is not available in SIT for relevant States for all years. <i>GHG Inventory by U.S. State</i> uses GHGRP data, and historical Voluntary aluminum Industry Partnership and production capacity to allocate to the states. The SIT tool is based on national averages of emission factors and technology type. The SIT tool does give the user the ability to import GHGRP data for 2010+; state emissions should be the same for 2010+ if this feature is used.	*
Magnesium Production and Processing	CO ₂ , HFCs, SF ₆	P	N	Default data is not available in SIT for all states for all years The SIT tool is based on national averages of emission factors, magnesium production and technology type. <i>GHG Inventory by U.S. State</i> uses GHGRP data, and historical data from the SF6 Emission Reduction Partnership for the Magnesium Industry and are based on reported gas consumption. <i>GHG Inventory by U.S. State</i> also include process types that are not included in the SIT, including wrought, anode and permanent.	*(production data) Δ (process types)
Lead Production	CO ₂	N	N	This source category is not included in SIT.	Δ
Zinc Production	CO ₂	N	N	This source category is not included in SIT.	Δ

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with <i>GHG Inventory by U.S. State</i> data
Electronics Industry	N ₂ O, HFCs, PFCs, SF ₆ , NF ₃	Y	N	<i>GHG Inventory by U.S. State</i> uses GHGRP data, historical PFC reduction partnership data, and production capacity data to develop national estimates and disaggregate to the state. The SIT tool uses the values of state and national semiconductor shipments.	*
Substitution of Ozone Depleting Substances	HFCs, PFCs	Y	Y	NA	NA
Electrical Transmission and Distribution	SF ₆	Y	N	The <i>GHG Inventory by U.S. State</i> uses transmission miles and GHGRP data to allocate to the states. The SIT tool uses state and national electricity sales.	*
N ₂ O from Product Uses	N ₂ O	N	N	This source category is not included in SIT.	Δ
Agriculture					
Enteric Fermentation	CH ₄	Y	Y (SIT state-level emission factors as based on national Inventory outputs)	NA	NA
Manure Management	CH ₄ , N ₂ O	Y	Y (SIT simplifies waste management system categories into dry versus liquid)	NA	NA
Rice Cultivation	CH ₄	Y	N	For the <i>GHG Inventory by U.S. State</i> , EPA is implementing a combination of IPCC Tier 1 and Tier 3 approaches, utilizing the Daycent process model to run Tier 3 components. Rice cultivation emissions are estimated for the 13 states who cultivate rice. The SIT tool simplifies the calculation between ratoon and primary area of rice, multiplied by a seasonal emission factor. The SIT tool estimates rice emissions for 7 states.	*
Liming	CO ₂	Y	Y	NA	NA
Urea Fertilization	CO ₂	Y	Y	NA	NA
Field Burning of Agricultural Residues	CH ₄ , N ₂ O	Y	Y	NA	NA
Agricultural Soil Management	N ₂ O	P	N	Default data is not available in SIT for all crops for all years. For the <i>GHG Inventory by U.S. State</i> , EPA is implementing a combination of IPCC Tier 1 and Tier 3 approaches, utilizing Daycent process model to run Tier 3 components. SIT uses a version of the Tier 1 method for both Direct and Indirect N ₂ O emissions estimation.	*

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/ method (Y/N)	Key Differences	Plans to align SIT with <i>GHG Inventory by U.S. State</i> data
Land Use, Land-Use Change, and Forestry					
Forest Land Remaining Forest Land (subcategories italicized below)	CO ₂ , CH ₄ , N ₂ O	Y	Y	NA	NA
<i>Changes in Forest Carbon Stocks</i>	CO ₂	Y	Y	SIT Tool provides estimation for “Wood Products and Landfills”. The <i>GHG Inventory by U.S. State</i> does not currently include data for harvested wood products at the state-level.	NA
<i>Non-CO₂ Emissions from Forest Fires</i>	CH ₄ , N ₂ O	Y	P	For the <i>GHG Inventory by U.S. State</i> , non-CO ₂ emissions from forest fires includes emissions from both forest land remaining forest land and land converted to forest land because it is not possible to report them separately at this time. Default activity data (acres burned) is not available in SIT, states must enter this data to calculate emissions.	*
<i>N₂O Emissions from Forest Soils</i>	N ₂ O	N	N	These source and sink categories are not included in SIT. For the <i>GHG Inventory by U.S. State</i> , N ₂ O emissions from forest soils includes emissions from both forest land remaining forest land and land converted to forest land because it is not possible to report them separately at this time.	NA
<i>Non-CO₂ Emissions from Drained Organic Soils</i>	CH ₄ , N ₂ O	N	N	These source and sink categories are not included in SIT. For the <i>GHG Inventory by U.S. State</i> , non-CO ₂ emissions from drained organic soils includes emissions from both forest land remaining forest land and land converted to forest land because it is not possible to report them separately at this time.	NA
Land Converted to Forest Land (subcategories italicized below)	CO ₂	Y	Y	NA	NA
<i>Changes in Forest Carbon Stocks</i>	CO ₂	Y	Y	NA	NA

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with GHG Inventory by U.S. State data
Cropland Remaining Cropland	CO ₂	Y	N	SIT aggregates soil carbon flux from cropland remaining cropland, land converted to cropland, grassland remaining grassland, and land remaining grassland. These categories are listed as "Ag Soil C Flux" in SIT. SIT provides default state data which has been apportioned to states based on the last year of available (2015) state-level data from the national GHGI. For the <i>GHG Inventory by U.S. State</i> , EPA apportioned states based on the last three (3) years of available state data.	*
<i>Changes in Mineral and Organic Soil Carbon Stocks</i>	CO ₂	Y	N		*
Land Converted to Cropland (subcategories italicized below)	CO ₂	Y	N		*
<i>Changes in all Ecosystem Carbon Stocks</i>	CO ₂	Y	N		*
Grassland Remaining Grassland (subcategories italicized below)	CO ₂ , CH ₄ , N ₂ O,	Y	N		*
<i>Changes in Mineral and Organic Soil Carbon Stocks</i>	CO ₂	Y	N		*
<i>Non-CO₂ Emissions from Grassland Fires</i>	CH ₄ , N ₂ O	N	N		Δ
Land Converted to Grassland (subcategories italicized below)	CO ₂	Y	N		*
<i>Changes in All Ecosystem Carbon Stocks</i>	CO ₂	Y	N		*
Wetlands Remaining Wetlands (subcategories italicized below)	CO ₂ , CH ₄ , N ₂ O	N	N	These source and sink categories are not included in SIT.	Δ
<i>Changes in Organic Soil Carbon Stocks in Peatlands</i>	CO ₂ ,	N	N		
<i>Changes in Biomass, DOM, and Soil Carbon Stocks in Coastal Wetlands</i>	CO ₂ ,	N	N		
<i>CH₄ Emissions from Coastal Wetlands Remaining Coastal Wetlands</i>	CH ₄	N	N		

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/method (Y/N)	Key Differences	Plans to align SIT with GHG Inventory by U.S. State data
<i>N₂O Emissions from Coastal Wetlands</i>	<i>N₂O</i>	<i>N</i>	<i>N</i>		
<i>Remaining Coastal Wetlands</i>					
<i>Non-CO₂ Emissions from Peatlands</i>	<i>CH₄, N₂O</i>	<i>N</i>	<i>N</i>		
<i>Remaining Peatlands</i>					
<i>Flooded Land remaining</i>	<i>CH₄</i>	<i>N</i>	<i>N</i>		
<i>Flooded Land</i>					
Land Converted to Wetlands (subcategories italicized below)	CO ₂ , CH ₄	N	N	These source and sink categories are not included in SIT.	Δ
<i>Changes in Biomass, DOM, and Soil Carbon Stocks</i>	CO ₂	N	N		
<i>CH₄ Emissions from Land Converted to Coastal Wetlands</i>	CH ₄	N	N		
<i>Lands converted to Flooded Lands</i>	CH ₄ , CO ₂	N	N		
Settlements Remaining Settlements (subcategories italicized below)	CO ₂ , N ₂ O	P	See below	See below.	See below
<i>Changes in Organic Soil Carbon Stocks</i>	CO ₂	N	N	These source and sink categories are not included in SIT.	Δ
<i>Changes in Settlement Tree Carbon Stocks (i.e., urban trees)</i>	CO ₂	Y	Y	NA	NA
<i>Changes in Yard Trimming and Food Scrap Carbon Stocks in Landfills (LFYTFS)</i>	CO ₂	Y	Y	NA	NA
<i>N₂O Emissions from Settlement Soils</i>	<i>N₂O</i>	Y	N	For N ₂ O emissions from Settlement Soils, SIT calculation is based on the Total Synthetic Fertilizer Applied to Settlements. The GHG Inventory by U.S. State is based on the amount of N in synthetic commercial fertilizers applied to settlement soils, the amount of N in biosolids applied to non-agricultural land and surface disposal, and the area of drained organic soils within settlements. EPA apportioned states based on the last three (3) years of available state data.	*

IPCC Sector/Source and/or Sink category	Gas(es)	Included in SIT (Y/N/P)	Uses same data/ method (Y/N)	Key Differences	Plans to align SIT with <i>GHG Inventory by U.S. State</i> data
Land Converted to Settlements (subcategories italicized below)	CO ₂	N	N	These source and sink categories are not included in SIT.	Δ
<i>Changes in all Ecosystem Carbon Stocks</i>	CO ₂	N	N		
Waste					
Landfills (municipal and industrial)	CH ₄ ,	P	N	<p>Municipal: SIT default data are based on national landfilling rates and state population. <i>GHG Inventory by U.S. State</i> uses GHGRP data that is scaled up to account for non-reporting landfills.</p> <p>Industrial: SIT uses a percent of MSW emissions to estimate industrial landfill emissions (default is 7%). <i>GHG Inventory by U.S. State</i> uses production volumes of pulp & paper, fruit & vegetables, and meat which is multiplied by a country and sector specific disposal factor and then used to calculate CH₄ emissions.</p>	*
Wastewater Treatment (domestic and industrial)	CH ₄ , N ₂ O	P	Y	<p>Note: The national <i>Inventory</i> wastewater emissions are estimated using 2019 Refinement to the 2006 IPCC Guidelines which includes refined methods and emission factors, but also now includes not only CH₄ but also N₂O emissions from Industrial wastewater treatment.</p> <p>Domestic: <i>GHG Inventory by U.S. State</i> downscales national <i>Inventory</i> estimates by state-level population or share of U.S. population.</p> <p>Industrial: SIT default data is not available for all industrial sources. The <i>GHG Inventory by U.S. State</i> allocates national emissions for each industry based on state share of national production. The <i>GHG Inventory by U.S. State</i> includes additional industries, i.e., both CH₄ and N₂O emissions from treatment of industrial wastewater from petroleum refining and breweries and CH₄ emissions were also estimated for treating industrial wastewater from starch-based ethanol production.</p>	*
Composting	CH ₄ , N ₂ O	N	NA	This source category is not included in SIT.	Δ
Anerobic Digestion at Biogas Facilities	CH ₄	N	NA	This source category is not included in SIT.	Δ

Key for Table Notations

P (Partial): Indicates a source is partially included in SIT, i.e., some but not all emissions within that source can be estimated by the tool and/or default activity data is missing or incomplete.

*: EPA is exploring potential to use *GHG Inventory by U.S. State* estimates to improve default data. States using the tool can opt to use *GHG Inventory by U.S. State* data or estimate using updated state-specific data if available.

Δ: EPA is evaluating adding this source to SIT. In the interim, we recommend states manually add totals from the *GHG Inventory by U.S. State* to SIT as “other.”

For more information, please visit the following:

- Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990-2020
<https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals>
- State Inventory Tool
<https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool>